

**SECTION 05 12 00  
STRUCTURAL STEEL FRAMING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

- A. This section specifies structural steel shown and classified by Section 2, Code of Standard Practice for Steel Buildings and Bridges.

**1.2 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Painting: Section 09 91 00, PAINTING.
- D. Steel Decking: Section 05 31 00, STEEL DECKING.
- E. Composite Steel Deck: Section 05 36 00, COMPOSITE METAL DECKING.
- F. Fireproofing: Section 07 81 00, APPLIED FIREPROOFING.
- G. Non-Shrink Grout: Section 03 30 00, Cast-in-Place Concrete.

**1.3 QUALITY ASSURANCE:**

- A. Fabricator and erector shall maintain a program of quality assurance in conformance with Section 8, Code of Standard Practice for Steel Buildings and Bridges. Work shall be fabricated in an AISC certified Category Conventional Steel Structures fabrication plant and steel shall be erected by an AISC Certified Steel Erector.
- B. Before authorizing the commencement of steel erection, the controlling contractor shall ensure that the steel erector is provided with the written notification required by 29 CFR 1926.752. Provide copy of this notification to the Resident Engineer.

**1.4 TOLERANCES:**

- A. Fabrication tolerances for structural steel shall be held within limits established by ASTM A6, by Section 7, Code of Standard Practice for Buildings and Bridges, and by Standard Mill Practice - General Information (AISC Steel Construction Manual, Thirteenth Edition, Page 1-9, except as follows:
  - 1. Elevation tolerance for column splice points at time member is erected is 10 mm (3/8 inch).
  - 2. Elevation tolerance for top surface of steel beams and girders at connections to columns at time floor is erected is 13 mm (1/2 inch).
  - 3. Elevation tolerance for closure plates at the building perimeter and at slab openings prior to concrete placement is 6 mm (1/4 inch).

**1.5 REGULATORY REQUIREMENTS:**

- A. AISC 360-05: Specification for Structural Steel Buildings.
- B. AISC 203-05: Code of Standard Practice for Steel Buildings and Bridges.

- C. AISC 341-05: Seismic Provisions for Structural Steel Buildings,  
Including Supplement No. 1.

#### **1.6 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA,  
AND SAMPLES.
- B. Shop and Erection Drawings: Complete set of drawings including erection  
plans, member fabrication drawings (including piece numbers, sizes,  
grades, dimensions, connection details, quantities, locations and  
dimensions of protected zones, etc.), anchor bolt details, and joint  
details for complete joint penetration details.
- C. Certificates:
  - 1. Structural steel.
  - 2. Steel for all connections.
  - 3. Welding materials, Welding Procedure Specifications (WPS), and  
Procedure Qualification Records (PQR).
  - 4. Shop coat primer paint.
  - 5. AISC Quality Certification for fabricator and erector.
- D. Test Reports:
  - 1. Welders' qualifying tests.
- F. Record Surveys.
- G. Inspection Reports

#### **1.7 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent  
referenced. Publications are referenced in text by basic designation  
only.
- B. American Institute of Steel Construction (AISC):
  - 1. AISC 360-05, Specification for Structural Steel Buildings (March  
2005).
  - 2. AISC 303-05, Code of Standard Practice for Steel Buildings and  
Bridges (March 2005).
  - 3. AISC 341-05, Seismic Provisions for Structural Steel Buildings,  
Including Supplement No. 1.
- C. American National Standards Institute (ANSI):
  - B18.22.1-98.....Plain Washers
  - B18.22M-00.....Metric Plain Washers
- D. American Society for Testing and Materials (ASTM):
  - A6/A6M-11.....Standard Specification for General Requirements  
for Rolled Structural Steel Bars, Plates,  
Shapes, and Sheet Piling
  - A36/A36M-05.....Standard Specification for Carbon Structural  
Steel

- A53/A53M-10.....Standard Specification for Pipe, Steel, Black  
and Hot-Dipped, Zinc-Coated Welded and Seamless
- A123/A123M-09.....Standard Specification for Zinc (Hot-Dip  
Galvanized) Coatings on Iron and Steel Products
- A242/A242M-R09.....Standard Specification for High-Strength Low-  
Alloy Structural Steel
- A283/A283M-R07.....Standard Specification for Low and Intermediate  
Tensile Strength Carbon Steel Plates
- A307-10.....Standard Specification for Carbon Steel Bolts  
and Studs, 60,000 psi Tensile Strength
- A325-10/A325M-09.....Standard Specification for Structural Bolts,  
Steel, Heat Treated, 120/105 ksi Minimum Tensile  
Strength
- A490-10a.....Standard Specification for Heat-Treated Steel  
Structural Bolts 150 ksi Minimum Tensile  
Strength
- A500-10a.....Standard Specification for Cold Formed Welded  
and Seamless Carbon Steel Structural Tubing in  
Rounds and Shapes
- A572/A572M-07.....Standard Specification for High-Strength  
Low-Alloy Columbium-Vanadium Structural Steel
- A992/A992M-11.....Standard Specification for Structural Steel  
Shapes
- F1852-08.....Standard Specification for "Twist Off" Type  
Tension Control Structural Bolt/Nut/Washer  
Assemblies, Steel, Heat Treated, 120/105 ksi  
Minimum Tensile Strength
- E. American Welding Society (AWS):
- D1.1-10.....Structural Welding Code-Steel
- F. Research Council on Structural Connections (RCSC) of The Engineering  
Foundation:
- Specification for Structural Joints Using ASTM A325 or A490 Bolts
- G. Military Specifications (Mil. Spec.):
- MIL-P-21035.....Paint, High Zinc Dust Content, Galvanizing,  
Repair
- H. Occupational Safety and Health Administration (OSHA):
- 29 CFR Part 1926-2001...Safety Standards for Steel Erection

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS:**

- A. W-Shapes: ASTM A992, unless indicated otherwise on Drawings.

- B. Rolled plates, shapes (except for W-Shapes), and Bars: ASTM A36, unless indicated otherwise. Plate material for special moment frame connections shall be ASTM A572, Grade 50.
- C. Structural Tubing: ASTM A500, Grade B.
- D. Steel Pipe: ASTM A53, Grade B.
- E. Bolts, Nuts and Washers:
  - 1. High-strength bolts, including nuts and washers:
    - a. Snug-tightened: ASTM A325 Type I or III, plain.
    - b. Pre-tensioned and Slip-critical: ASTM A325, Type I or III, plain; Twist-off Type Tension-Control (TC) Bolts conforming with ASTM F 1852 (Type I or III, plain) may be used with approval of the Resident Engineer
  - 2. Bolts and nuts, other than high-strength: ASTM A307, Grade A.
  - 3. Plain washers, other than those in contact with high-strength bolt heads and nuts: ANSI Standard B18.22.1.
  - 4. Anchor rods:
    - a. At special moment frames: ASTM A449
    - b. At other locations: ASTM F1554, Grade 36.
- F. Zinc Coating: ASTM A123.
- G. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035.
- H. Non-shrink Grout: As specified in Section 03 30 00, Cast-in-Place Concrete.

### **PART 3 - EXECUTION**

#### **3.1 CONNECTIONS (SHOP AND FIELD):**

- A. Welding: Welding in accordance with AWS D1.1. Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.1 to perform type of work required.
- B. Contractor's Certified Welding Inspector (CWI) shall be present whenever shop or field welding is performed. CWI shall perform inspection, as necessary, prior to assembly, during assembly, during welding, and after welding. CWI shall perform inspections as required in AWS D1.1/D1.1M or referenced welding code and as follows:
  - 1. Verifying conformance of specified job material and proper storage.
  - 2. Monitoring conformance with approved WPS.
  - 3. Monitoring conformance of WPQ.
  - 4. Inspecting weld joint fit-up and performing in-process inspection.
  - 5. Providing 100 percent visual inspection of welds.
  - 6. Supervising nondestructive testing personnel and evaluating test results.
  - 7. Maintaining records and preparing report confirming results of inspection and testing comply with the Work.

C. Weld Inspection Criteria:

1. Selection of welds to be tested, unless 100 percent NDT is specified herein, shall be as agreed upon between Engineer and Contractor.
2. Welds associated with special moment frame connections: All welds associated with special moment frame connections are designated demand critical welds. Inspect and test in accordance with Appendix Q, AISC 341-05.
3. Welds not associated with special moment frames: Unless otherwise specified, perform NDT of welds at a frequency as shown below in accordance with referenced welding codes as follows. Perform UT on CJP groove welds that cannot be readily radiographed. In case there is a conflict, higher frequency level of NDT shall apply.
  - a. CJP Groove, Butt Joint Welds: 10 percent random RT.
  - b. All other CJP Groove Welds: 10 percent random UT.
  - c. Fillet Welds and PJP Groove Welds: 10 percent random PT or MT.
  - d. All Welds: 100 percent VT.
4. Weld Acceptance: Per appropriate sections of AWS D1.1/D1.1M, Chapter 6.

D. High-Strength Bolted Connections:

1. General
  - a. Tighten in accordance with RCSC Specification for Structural Joints Using ASTM A325 or ASTM A490 Bolts.
  - b. Hardened Washers:
    1. Provide at locations required by "Use of Washers" Section of RCSC Specifications.
    2. Use beveled style and extra thickness where required by RCSC Specifications.
    3. Do not substitute Direct Tension Indicator (DTI) washers for washers required at slotted and oversized holes.
2. Snug-Tightened (ST) Joints: Unless noted otherwise on the Drawings, connections using high-strength bolts shall be bearing-type (N or X).
  - a. bolts shall be tightened to snug-tight conditions
  - b. Twist-off Type Tension-Control (TC) bolts may be used in snug tightened joints when approved by the Resident Engineer.
3. Pre-Tensioned (PT) and Slip-Critical (SC) Joints:
  - a. See Drawings for joints identified as PT or SC.
  - b. Tighten High-Strength bolts in PT and SC joints to achieve the minimum bolt pretension load given in RCSC Specification, using one of the following pretensioning methods or assemblies:
    1. Turn-of-nut
    2. Calibrated wrench

- 3. Twist-Off Type Tension-Control (TC) bolt
- 4. Direct-Tension-Indicator (DTI) washer
- 4. Inspection of Reduced Beam Section Elements of special moment frame connections: in accordance with Appendix Q, AISC 341-05.
- 5. Inspection of High-Strength Bolted Connections
  - a. Bolted connections associated with special moment frames shall be inspected in accordance with Appendix Q, AISC 341-05.
  - b. Bolted connections not associated with special moment frames shall be inspected in accordance with RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts.

### **3.2 FABRICATION:**

- A. Fabrication in accordance with Chapter M, Specification for Steel Buildings.

### **3.3 SHOP PAINTING:**

- A. General: Shop paint steel with primer in accordance with Section 6, Code of Standard Practice for Steel Buildings and Bridges.
- B. Shop paint for steel surfaces is specified in Section 09 91 00, PAINTING.
- C. Do not apply paint to following:
  - 1. Surfaces within 50 mm (2 inches) of joints to be welded in field.
  - 2. Surfaces which will be encased in concrete.
  - 3. Surfaces which will receive sprayed on fireproofing.
  - 4. Top flange of members which will have shear connector studs applied.
  - 5. Surfaces to be galvanized.
- D. Zinc Coated (Hot Dip Galvanized) per ASTM A123 (after fabrication):  
Touch-up after erection: Clean and wire brush any abraded and other spots worn through zinc coating, including threaded portions of bolts and welds and touch-up with galvanizing repair paint.

### **3.4 ERECTION:**

- A. General: Erection in accordance with Section 7, Code of Standard Practice for Steel Buildings and Bridges.
- B. Temporary Supports: Temporary support of structural steel frames during erection in accordance with Section 7, Code of Standard Practice for Steel Buildings and Bridges.

### **3.5 FIELD PAINTING:**

- A. After erection, touch-up steel surfaces specified to be shop painted. After welding is completed, clean and prime areas not painted due to field welding.

B. Finish painting of steel surfaces is specified in Section 09 91 00, PAINTING.

**3.6 SURVEY:**

A. Upon completion of finish bolting or welding on any part of the work, and prior to start of work by other trades that may be supported, attached, or applied to the structural steel work, submit a certified report of survey to Resident Engineer for approval. Reports shall be prepared by Registered Land Surveyor or Registered Civil Engineer as specified in Section 01 00 00, GENERAL REQUIREMENTS. Report shall specify that location of structural steel is acceptable for plumbness, level and alignment within specified tolerances specified in the AISC Manual.

- - - E N D - - -

**SECTION 05 31 00  
STEEL DECKING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies material and services required for installation of steel decking as shown and specified.

**1.2 RELATED WORK:**

- A. Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.
- B. Finish Painting: Section 09 91 00, PAINTING.

**1.3 DESIGN REQUIREMENTS:**

- A. Design steel decking in accordance with AISI publication, "Specification for the Design of Cold-formed Steel Structural Members" except as otherwise shown or specified.
- B. Design all elements with the latest published version of applicable codes.

**1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and similar information necessary for completing installation as shown and specified, including supplementary framing, sump pans, ridge and valley plates, cant strips, cut openings, special jointing or other accessories. Show welding, side lap, closure, deck reinforcing and closure reinforcing details. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.
- C. Manufacturer's Literature and Data: Showing steel decking section properties and specifying structural characteristics.
- D. Certification: For each type and gauge of metal deck supporting concrete slab or fill, furnish certification of the specified fire ratings. Certify that the units supplied are U.L. listed as a "Steel Floor and Form Unit".
- E. Insurance Certification: Assist the Government in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance.



**1.5 QUALITY ASSURANCE:**

- A. FM Listing: Provide metal roof deck units which have been evaluated by Factory Mutual Global and are listed in "Factory Mutual Research Approval Guide" for "Class 1" fire rated construction.

**1.6 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Society for Testing and Materials (ASTM):
  - A36/A36M-08.....Standard Specification for Carbon Structural Steel
  - A653/A653M-08.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
  - C423-08.....Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- C. American Institute of Steel Construction (AISC):
  - 1. Specification for Structural Steel Buildings (latest Edition)
- D. American Iron and Steel Institute (AISI):
  - 1. Specification and Commentary for the Design of Cold-Formed Steel Structural Members
- E. American Welding Society (AWS):
  - D1.3-08.....Structural Welding Code - Sheet Steel
- F. Factory Mutual (FM Global):
  - 1. Loss Prevention Data Sheet 1-28: Wind Loads to Roof Systems and Roof Deck Securement
  - 2. Factory Mutual Research Approval Guide (2002)
- G. Military Specifications (Mil. Spec.)
  - MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

**PART 2 - PRODUCTS****2.1 MATERIALS:**

- A. Steel Decking: ASTM A653, Structural Quality.
- B. Galvanizing: ASTM A653, G60.
- C. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- D. Miscellaneous Steel Shapes: ASTM A36.
- E. Welding Electrode: E60XX minimum.
- F. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation

of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:

1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
2. Continuous Sheet Metal Edging: At openings, concrete slab edges and roof deck edges. Same quality as deck units but not less than 1.3 mm (18 gauge) steel. Side and end closures supporting concrete and their attachment to supporting steel shall be designed by the manufacturer to safely support the wet weight of concrete and construction loads. The deflection of cantilever closures shall be limited to 3 mm (1/8 inch) maximum.
3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.
4. Ridge and Valley Plates: Provide 1.3 mm (18 gauge), minimum 100 mm (4 inch) wide ridge and valley plates where roof slope exceeds 40 mm per meter (1/2 inch per foot).
5. Cant Strips: Provide bent metal 45 degree leg cant strips where indicated on the Drawings. Fabricate cant strips from 1 mm (20 gauge) metal with a minimum 125 mm (5 inch) face width.
6. Seat Angles for Deck: Provide where a beam does not frame into a column.
7. Sump Pans for Roof Drains: Fabricated from single piece of minimum 1.9 mm (14 gauge) galvanized sheet steel with level bottoms and sloping sides to direct water flow to drain, unless otherwise shown. Provide sump pans of adequate size to receive roof drains and with bearing flanges not less than 75 mm (3 inches) wide. Recess pans not less than 38 mm (1 1/2 inches) below roof deck surface, unless otherwise shown or required by deck configuration. Holes for drains will be cut in the field.

## **2.2 REQUIREMENTS:**

- A. Provide steel decking of the type, depth, gauge, and section properties as shown.
- B. Metal Roof Deck: Single pan fluted units with flat horizontal top surfaces utilized to act as a permanent support for all superimposed loads. Comply with the depth and minimum gage requirements as shown on the Contract Documents.
  1. Wide Rib (Type B) deck.

2. Finish: Galvanized G-60.

- C. Do not use steel deck for hanging supports for any type or kind of building components including suspended ceilings, electrical light fixtures, plumbing, heating, or air conditioning pipes or ducts or electrical conduits.

### **PART 3 - EXECUTION**

#### **3.1 ERECTION:**

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.
- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- D. Provide steel decking in sufficient lengths to extend over 3 or more spans, except for interstitial levels.
- E. Place steel decking units at right angles to supporting members. End laps of sheets of roof deck shall be a minimum of 50 mm (2 inches) and shall occur over supports.
- F. Fastening Deck Units:
1. Fasten roof deck units to steel supporting members by not less than 19 mm (3/4 inch) diameter puddle welds or elongated welds of equal strength, spaced as indicated on the Drawings. Attach split or partial panels to the structure in every valley. In addition, secure deck to each supporting member in ribs where side laps occur. Powder driven fasteners may be used in lieu of welding for roof deck if strength equivalent to the welding specified is provided. Submit test data and design calculations verifying equivalent design strength.
  2. Mechanically fasten or weld side laps of adjacent roof deck units as indicated on the Drawings.
  3. Provide any additional fastening necessary to comply with the requirements of Underwriters Laboratories and/or Factory Mutual to achieve the required ratings.
  4. Uplift Loading: Install and anchor roof deck units to resist gross uplift loading of 3.2 kPa (67 psf) at eave overhang and 2.1 kPa (45 psf) for other roof areas.
- G. Cutting and Fitting:

1. Cut all metal deck units to proper length in the shop prior to shipping.
2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the Structural Drawings.
3. Other penetrations shown on the approved metal deck shop drawings but not shown on the Structural Drawings are to be located, cut and reinforced by the trade requiring the opening.
4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.
5. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the Resident Engineer. Provide any additional reinforcing or framing required for the opening at no cost to the Government. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected metal deck.
6. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as shown on the Drawings and as required for strength, continuity of decking, and support of other work shown.

### **3.2 WELDING:**

Welds shall be made only by welders and welding operators who have been previously qualified by tests as prescribed in AWS D1.3.

### **3.3 FIELD REPAIR:**

- A. Areas scarred during erection. Welds to be thoroughly cleaned and touched-up. Touch-up paint for zinc-coated units shall be zinc rich galvanizing repair paint.

- - - E N D - - -

**SECTION 05 36 00  
COMPOSITE METAL DECKING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

This section specifies material and services required for installation of composite steel decking including shear connector studs and miscellaneous closures required to prepare deck for concrete placement as shown and specified.

**1.2 RELATED WORK:**

Materials testing and inspection during construction: Section 01 45 29, TESTING LABORATORY SERVICES.

**1.3 DESIGN REQUIREMENTS:**

- A. Design steel decking in accordance with American Iron And Steel Institute publication "Specifications for the Design of Cold Formed Steel Structural Members", except as otherwise shown or specified.
- B. Design all elements with the latest published version of applicable codes.

**1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing decking unit layout, connections to supporting members, and information necessary to complete the installation as shown and specified, including supplementary framing, cant strips, cut openings, special jointing or other accessories. Show welding, side lap, closure, deck reinforcing and closure reinforcing details. Show openings required for work of other trades, including openings not shown on structural drawings. Indicate where temporary shoring is required to satisfy design criteria.
- C. Manufacturer's Literature and Data: Showing steel decking section properties and specifying structural characteristics as specified herein.
- D. Manufacturer's written recommendations for:
  - 1. Shape of decking section to be used.
  - 2. Cleaning of steel decking prior to concrete placement.
- E. Test Report - Establishing structural characteristics of composite concrete and steel decking system.
- F. Test Report - Stud base qualification.
- G. Welding power setting recommendation by shear stud manufacturer.
- H. Shear Stud Layouts: Submit drawings showing the number, pattern, spacing and configuration of the shear studs for each beam and girder.

- I. Certification: For each type and gauge of metal deck supporting concrete slab or fill, furnish certification of the specified fire ratings. Certify that the units supplied are U.L. listed as a "Steel Floor and Form Unit".

#### **1.5 QUALITY ASSURANCE:**

Underwriters' Label: Provide metal floor deck units listed in Underwriters' Laboratories "Fire Resistance Directory", with each deck unit bearing the UL label and marking for specific system detailed.

#### **1.6 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only. Refer to the latest edition of all referenced Standards and codes.
- B. American Iron and Steel Institute (AISI):  
Specification and Commentary for the Design of Cold-Formed Steel Structural Members (Latest Edition).
- C. American Society of Testing and Materials (ASTM):  
A36/A36M.....Standard Specification for Carbon Structural Steel  
A108.....Standard Specification for Steel Bars, Carbon, Cold Finished, Standard Quality  
A653/A653M.....Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process
- D. American Institute of Steel Construction (AISC):  
1. Specification for Structural Steel Buildings (March 2005).
- E. American Welding Society (AWS):  
D1.1.....Structural Welding Code - Steel  
D1.3.....Structural Welding Code - Sheet Steel
- E. Military Specifications (Mil. Spec.):  
MIL-P-21035B.....Paint, High Zinc Dust Content, Galvanizing Repair

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS:**

- A. Steel Decking and all Flashings: ASTM A653, Structural Quality suitable for shear stud weld-through techniques.
- B. Galvanizing: ASTM A653, G60.
- C. Shear connector studs: ASTM A108, Grades 1015-1020, yield 350 Mpa (50,000 psi) minimum, tensile strength - 400 Mpa (60,000 psi) minimum, reduction of area 50 percent minimum. Studs of uniform diameter; heads shall be concentric and normal to shaft; stud, after welding free from

any substance or defect which would interfere with its function as a shear connector. Studs shall not be painted or galvanized. Size of studs shall be as shown on drawings. Studs manufactured by a company normally engaged in the manufacture of shear studs and can furnish equipment suitable for weld-through installation of shear studs.

- D. Galvanizing Repair Paint: Mil. Spec. MIL-P-21035B.
- E. Miscellaneous Steel Shapes: ASTM A36.
- F. Welding Electrode: E60XX minimum.
- G. Sheet Metal Accessories: ASTM A653, galvanized, unless noted otherwise. Provide accessories of every kind required to complete the installation of metal decking in the system shown. Finish sheet metal items to match deck including, but not limited to, the following items:
  - 1. Metal Cover Plates: For end-abutting deck units, to close gaps at changes in deck direction, columns, walls and openings. Same quality as deck units but not less than 1.3 mm (18 gauge) sheet steel.
  - 2. Continuous closure plates at openings and concrete slab edges: minimum ¼-inch plate steel, except where indicated otherwise on drawings.
  - 3. Metal Closure Strips: For openings between decking and other construction, of not less than 1.3 mm (18 gauge) sheet steel of the same quality as the deck units. Form to the configuration required to provide tight-fitting closures at open ends of flutes and sides of decking.
  - 4. Seat angles for deck: Where a beam does not frame into a column.

## **2.2 REQUIREMENTS:**

- A. Steel decking depth, gage, and section properties to be as shown. Provide edges of deck with vertical interlocking male and female lip providing for a positive mechanical connection.
- B. Fabricate deck units with integral embossments to provide mechanical bond with concrete slab. In combination with concrete slab, capable of supporting total design loads on spans shown.
- C. Steel decking capable of safely supporting total, normal construction service loads without damage to decking unit.

## **PART 3 - EXECUTION**

### **3.1 ERECTION:**

- A. Do not start installation of metal decking until corresponding steel framework has been plumbed, aligned and completed and until temporary shoring, where required, has been installed. Remove any oil, dirt, paint, ice, water and rust from steel surfaces to which metal decking will be welded.

- B. Coordinate and cooperate with structural steel erector in locating decking bundles to prevent overloading of structural members.
- C. Do not use floor deck units for storage or working platforms until permanently secured. Do not overload deck units once placed. Replace any deck units that become damaged after erection and prior to casting concrete at no cost to the Government.
- D. Erect steel deck in accordance with manufacturer's printed instructions.
- E. Ship steel deck units to project in standard widths and cut to proper length.
- F. Provide steel decking in sufficient lengths to extend over 3 or more spans, except where structural steel layout does not permit.
- G. Place steel decking units on supporting steel framework and adjust to final position before being permanently fastening. Bring each unit to proper bearing on supporting beams with minimum 1-1/2-inch bearing length. Place deck units in straight alignment for entire length of run of flutes and with close registration of flutes of one unit with those of abutting unit. End laps shall be minimum of 2 inches in length and located over supports.
- I. Fastening Deck Units:
  - 1. Weld floor deck units to steel supporting members at spacings and patterns indicated on the Drawings.
  - 2. Tack weld at maximum 915 mm (3 feet) o.c. for fastening end closures.
  - 3. Weld side laps of adjacent floor deck units at spacing indicated on the Drawings.
- J. Welding to conform to AWS D1.3 and done by competent experienced welding mechanics.
- K. Areas scarred during erection and welds shall be thoroughly cleaned and touched-up with zinc rich galvanizing repair paint. Paint touch-up is not required for welds or scars that are to be in direct contact with concrete.
- L. Provide metal concrete stops at edges of deck as required.
- M. Cutting and Fitting:
  - 1. Cut all metal deck units to proper length in the shop prior to shipping.
  - 2. Field cutting by the metal deck erector is restricted to bevel cuts, notching to fit around columns and similar items, and cutting openings that are located and dimensioned on the structural drawings.
  - 3. Other penetrations shown on the approved metal deck shop drawings but not shown on the structural drawings are to be located, cut and reinforced by the trade requiring the opening.



4. Make all cuts neat and trim using a metal saw, drill or punchout device; cutting with torches is expressly prohibited.
  5. Do not make any cuts in the metal deck that are not shown on the approved metal deck drawings. If an additional opening not shown on the approved shop drawings is required, submit a sketch, to scale, locating the required new opening and any other openings and supports in the immediate area. Do not cut the opening until the sketch has been reviewed and accepted by the Resident Engineer. Provide any additional reinforcing or framing required for the opening at no cost to the Government. Failure to comply with these requirements is cause for rejection of the work and removal and replacement of the affected metal deck.
  6. Reinforcement at Openings: Provide additional metal reinforcement and closure pieces as shown on the Drawings as required for strength, continuity of decking and support of other work shown.
- N. Installation of shear connector studs through previously installed metal deck to conform to AWS D1.1, Section 7, except all studs will be installed with automatically timed welding equipment and as specified below:
1. Do not place reinforcing steel or other materials and equipment which will interfere with stud installation on steel deck until shear connector studs are installed.
  2. Steel deck sheets shall be free of oil, rust, dirt, and paint. Release water in deck's valley so that it does not become entrapped between deck and beam. Surface to which stud is to be welded shall be clean and dry.
  3. Rest metal deck tightly upon top flange of structural member with bottom of deck rib in full contact with top of beam flange.
  4. Weld studs only through a single thickness of deck. Place decking so that a butt joint is obtained. Place studs directly over beam web, where one row of studs are required.
  5. Ferrules specially developed for the weld-through technique must be used. Ferrules shall be appropriate for size of studs used and be removed after welding.
  6. Submit report of successful test program for stud base qualification as required by AWS D1.1, Appendix K.

### **3.2 CLEANING:**

Clean deck in accordance with manufacturer's recommendation before concrete placement.

- - - E N D - - -

**SECTION 05 40 00  
COLD-FORMED METAL FRAMING**

**PART 1 - GENERAL**

**1.1 DESCRIPTION:**

A. This section specifies materials and services required for installation of cold-formed steel, including tracks and required accessories as shown and specified. This Section includes the following:

1. Exterior non-load-bearing steel stud curtain wall.

**1.2 RELATED WORK:**

- A. Structural steel framing: Section 05 12 00, STRUCTURAL STEEL FRAMING.
- B. Non-load-bearing metal stud framing assemblies: Section 09 22 16, NON-STRUCTURAL METAL FRAMING.
- C. Gypsum board assemblies: Section 09 29 00, GYPSUM BOARD.

**1.3 DESIGN REQUIREMENTS:**

- A. Design steel in accordance with American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise shown or specified.
- B. Structural Performance: Engineer, fabricate and erect cold-formed metal framing with the minimum physical and structural properties indicated.

**1.4 SUBMITTALS:**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Shop and erection drawings showing steel unit layout, connections to supporting members, and information necessary to complete installation as shown and specified.
- C. Manufacturer's Literature and Data: Showing steel component sections and specifying structural characteristics.

**1.5 APPLICABLE PUBLICATIONS:**

- A. Publications listed below form a part of this specification to extent referenced. Publications are referenced in text by basic designation only.
- B. American Iron and Steel Institute (AISI):  
  
Specification and Commentary for the Design of Cold-Formed Steel Structural Members (1996)

## C. American Society of Testing and Materials (ASTM):

- A36/A36M(REV. A)-2003...Standard Specifications for Carbon Structural Steel
- A123/A123M-2002.....Standard Specifications for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- A153/A153M-2003.....Standard Specifications for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
- A307-2002.....Standard Specifications for Carbon Steel Bolts and Studs
- A653/A653M-2003.....Standard Specifications for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- C955-2003.....Standard Specifications for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
- C1107-2002.....Standard Specifications for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
- E488-96(Reapproved 2003)Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements
- E1190-95(Reapproved 2000)Standard Test Methods for Strength of Power-Actuated Fasteners Installed in Structural Members

## D. American Welding Society (AWS):

- D1.3-(98).....Structural Welding Code-Sheet Steel

## E. Military Specifications (Mil. Spec.):

- MIL-P-21035B(Reinst. Notice 2)      Paint, High Zinc Dust Content, Galvanizing Repair

**PART 2 - PRODUCTS****2.1 MATERIALS:**

- A. Sheet Steel for joists, studs and accessories 16 gage and heavier:  
ASTM A653, structural steel, zinc coated G60, with a yield of 340 MPa (50 ksi) minimum.
- B. Sheet Steel for joists, studs and accessories 18 gage and lighter:  
ASTM A653, structural steel, zinc coated G60, with a yield of 230 MPa (33 ksi) minimum.
- C. Galvanizing Repair Paint: MIL-P-21035B.
- D. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, Portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107, with fluid consistency and a 30 minute working time.

**2.2 WALL FRAMING:**

- A. Steel Studs: Manufacturer's standard C-shaped steel studs of web depth indicated, with lipped flanges, and complying with the following:
  - 1. Design Uncoated-Steel Thickness (unless noted otherwise): 1.20 mm (0.0474 inch).
  - 2. Flange Width (unless noted otherwise): 2 inches.
  - 3. Web: Punched.
- B. Steel Track: Manufacturer's standard U-shaped steel track, unpunched, of web depths indicated, with straight flanges, and complying with the following:
  - 1. Design Uncoated-Steel Thickness: Matching steel studs.
  - 2. Flange Width: Manufacturer's standard deep flange where indicated, standard flange elsewhere.

**2.4 FRAMING ACCESSORIES:**

- A. Fabricate steel framing accessories of the same material and finish used for framing members, with a minimum yield strength of 230 MPa (33 ksi).

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Gusset plates.
5. Deflection track and vertical slide clips.
6. Stud kickers and girts.
7. Joist hangers and end closures.
8. Reinforcement plates.

#### **2.5 ANCHORS, CLIPS, AND FASTENERS:**

- A. Steel Shapes and Clips: ASTM A36, zinc coated by the hot-dip process according to ASTM A123.
- B. Cast-in-Place Anchor Bolts and Studs: ASTM A307, Grade A, zinc coated by the hot-dip process according to ASTM A153.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times the design load, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
- D. Powder-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times the design load, as determined by testing per ASTM E1190 conducted by a qualified independent testing agency.
- E. Mechanical Fasteners: Corrosion-resistant coated, self-drilling, self-threading steel drill screws. Low-profile head beneath sheathing, manufacturer's standard elsewhere.

#### **2.6 REQUIREMENTS:**

- A. Welding in accordance with AWS D1.3
- B. Furnish members and accessories by one manufacturer only.

- C. No stud, track, or bracing attachments of any kind (welds, mechanical fasteners, powder-actuated fasteners, etc.) shall be made to protected zones of beams in moment-resisting frames. See Drawings for locations.

### **PART 3 - EXECUTION**

#### **3.1 FABRICATION:**

- A. Framing components may be preassembled into panels. Panels shall be square with components attached.
- B. Cut framing components squarely or as required for attachment. Cut framing members by sawing or shearing; do not torch cut.
- C. Hold members in place until fastened.
- D. Fasten cold-formed metal framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
  - 1. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
  - 2. Locate mechanical fasteners and install according to cold-formed metal framing manufacturer's instructions with screw penetrating joined members by not less than 3 exposed screw threads.
- E. Where required, provide specified insulation in double header members and double jamb studs which will not be accessible after erection.

#### **3.2 ERECTION:**

- A. Handle and lift prefabricated panels in a manner as to not distort any member.
- B. No stud, track, or bracing attachments of any kind (welds, mechanical fasteners, powder-actuated fasteners, etc.) shall be made to protected zones of beams in moment-resisting frames. See Drawings for locations.
- C. Securely anchor tracks to supports as shown.
- D. At butt joints, securely anchor two pieces of track to same supporting member or butt-weld or splice together.
- E. Plumb, align, and securely attach studs to flanges or webs of both upper and lower tracks.

- F. All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.
- G. Install jack studs above and below openings and as required to furnish support. Securely attach jack studs to supporting members.
- H. Install headers in all openings that are larger than the stud spacing in that wall.
- I. Attach bridging for studs in a manner to prevent stud rotation. Space bridging rows as shown.
- J. Studs in one piece for their entire length, splices will not be permitted.
- N. Provide temporary bracing and leave in place until framing is permanently stabilized.
- O. Do not bridge building expansion joints with cold-formed metal framing. Independently frame both sides of joints.
- P. Fasten reinforcement plate over web penetrations that exceed size of manufacturer's standard punched openings.

### 3.3 TOLERANCES:

- A. Vertical alignment (plumbness) of studs shall be within 1/960th of the span.
- B. Horizontal alignment (levelness) of walls shall be within 1/960th of their respective lengths.
- C. Spacing of studs shall not be more than 3 mm (1/8 inch) +/- from the designed spacing providing that the cumulative error does not exceed the requirements of the finishing materials.
- D. Prefabricated panels shall be not more than 3 mm (1/8 inch) +/- out of square within the length of that panel.

### 3.4 FIELD REPAIR:

- A. Touch-up damaged galvanizing with galvanizing repair paint.

- - - E N D - - -

**SECTION 05 50 00  
METAL FABRICATIONS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. This section specifies items and assemblies fabricated from structural steel shapes and other materials as shown and specified.
- B. Items specified.
  - 1. Support for Wall and Ceiling Mounted Items
  - 2. Guards
  - 3. Covers and Frames for Pits and Trenches.
  - 4. Gratings
  - 5. Loose Lintels
  - 6. Shelf Angles
  - 7. Safety Nosings
  - 8. Ladders
  - 9. Railings
  - 10. Sidewalk Access Doors

**1.2 RELATED WORK**

- A. Railings attached to steel stairs: Section 05 51 00, METAL STAIRS.
- B. Colors, finishes, and textures: Section 09 06 00, SCHEDULE FOR FINISHES.
- C. Prime and finish painting: Section 09 91 00, PAINTING.
- D. Stainless steel corner guards: Section 10 26 00, WALL AND DOOR PROTECTION.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Manufacturer's Literature and Data (product description and installation procedures):

Grating, each type	Floor plate
Post-Installed Concrete Expansion Anchors	Wheel guards
Post-Installed Concrete Adhesive Anchors	Sidewalk Access door
Manhole Covers	Safety nosing

- C. Shop Drawings:
  - 1. Each item specified, showing complete detail, location in the project, material and size of components, method of joining various components and assemblies, finish, and location, size and type of anchors.
  - 2. Mark items requiring field assembly for erection identification and furnish erection drawings and instructions.



3. Provide templates and rough-in measurements as required.
- D. Manufacturer's Certificates:
  1. Anodized finish as specified.
  2. Live load designs as specified.
  3. For post-installed concrete anchors, provide Current test data or ICC Evaluation Report
- E. Design Calculations for specified live loads including dead loads.
- F. Furnish setting drawings and instructions for installation of anchors to be preset into concrete work, and for the positioning of items having anchors to be built into concrete or masonry construction.

#### 1.4 QUALITY ASSURANCE

- A. Each manufactured product shall meet, as a minimum, the requirements specified, and shall be a standard commercial product of a manufacturer regularly presently manufacturing items of type specified.
- B. Each product type shall be the same and be made by the same manufacturer.
- C. Assembled product to the greatest extent possible before delivery to the site.
- D. Include additional features, which are not specifically prohibited by this specification, but which are a part of the manufacturer's standard commercial product.

#### 1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society of Mechanical Engineers (ASME):
  - B18.6.1-81(R1997).....Wood Screws
  - B18.2.2-87(R2005).....Square and Hex Nuts
- C. American Society for Testing and Materials (ASTM):
  - A36/A36M-05.....Structural Steel
  - A47-99(R2004).....Malleable Iron Castings
  - A48-03.....Gray Iron Castings
  - A53-06.....Pipe, Steel, Black and Hot-Dipped, Zinc-Coated  
Welded and Seamless
  - A123-02.....Zinc (Hot-Dip Galvanized) Coatings on Iron and  
Steel Products
  - A167-99(R2004).....Stainless and Heat-Resisting Chromium-Nickel  
Steel Plate, Sheet and Strip
  - A269-07.....Seamless and Welded Austenitic Stainless Steel  
Tubing for General Service

- A307-07.....Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
- A312/A312M-06.....Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes
- A391/A391M-01.....Grade 80 Alloy Steel Chain
- A653/A653M-07.....Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process
- A786/A786M-05.....Rolled Steel Floor Plate
- B221-06.....Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes
- B456-03.....Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
- B632-02.....Aluminum-Alloy Rolled Tread Plate
- C1107-07.....Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
- D3656-04.....Insect Screening and Louver Cloth Woven from Vinyl-Coated Glass Yarns
- F436-07.....Hardened Steel Washers
- F468-06.....Nonferrous Bolts, Hex Cap Screws, and Studs for General Use
- F593-02.....Stainless Steel Bolts, Hex Cap Screws, and Studs
- F1667-05.....Driven Fasteners: Nails, Spikes and Staples
- D. American Welding Society (AWS):
- D1.1-04.....Structural Welding Code Steel
- D1.2-03.....Structural Welding Code Aluminum
- D1.3-98.....Structural Welding Code Sheet Steel
- E. National Association of Architectural Metal Manufacturers (NAAMM)
- AMP521-01.....Pipe Railing Manual
- AMP 500-505-1988.....Metal Finishes Manual
- MBG 531-00.....Metal Bar Grating Manual
- MBG 532-00.....Heavy Duty Metal Bar Grating Manual
- F. Structural Steel Painting Council (SSPC):
- SP 1-05.....No. 1, Solvent Cleaning
- SP 2-05.....No. 2, Hand Tool Cleaning
- SP 3-05.....No. 3, Power Tool Cleaning
- G. Federal Specifications (Fed. Spec):
- RR-T-650E.....Treads, Metallic and Nonmetallic, Nonskid

## **PART 2 - PRODUCTS**

### **2.1 DESIGN CRITERIA**

- A. In addition to the dead loads, design fabrications to support the following live loads unless otherwise specified.

- B. Ladders and Rungs: 120 kg (250 pounds) at any point.
- C. Railings and Handrails: 900 N (200 pounds) in any direction at any point, or 730 N/m (50 lb/ft) in any direction along top rail.
- D. Floor Plates, Gratings, Covers: 500 kg/m<sup>2</sup> (100 pounds per square foot).  
Use 225 kg (500 pounds) for concentrated loads. Use 1500 kg/m<sup>2</sup> (200 pounds per square foot) for vehicle loads in the following areas:

- E. Manhole Covers: 1200 kg/m<sup>2</sup> (250 pounds per square foot).

## 2.2 MATERIALS

- A. Structural Steel: ASTM A36.
- B. Stainless Steel: ASTM A167, Type 302 or 304.
- C. Aluminum, Extruded: ASTM B221, Alloy 6063-T5 unless otherwise specified.  
For structural shapes use alloy 6061-T6 and alloy 6061-T4511.
- D. Floor Plate:
  - 1. Steel ASTM A786.
  - 2. Aluminum: ASTM B632.
- E. Steel Pipe: ASTM A53.
  - 1. Galvanized for exterior locations.
  - 2. Type S, Grade A unless specified otherwise.
  - 3. NPS (inside diameter) as shown.
- F. Cast-Iron: ASTM A48, Class 30, commercial pattern.
- G. Malleable Iron Castings: A47.
- H. Primer Paint: As specified in Section 09 91 00, PAINTING.
- I. Stainless Steel Tubing: ASTM A269, type 302 or 304.
- J. Support and Framing Channels:
  - 1. Carbon Steel Framing Channel:
    - a. Material: Rolled, mild strip steel, 12 gauge, ASTM A1011/A1011M, Grade 33.
    - b. Finish: Hot-dip galvanized after fabrication.
  - 2. Stainless Steel Framing Channel: Rolled, ASTM A167, Type 316 stainless steel, 12 gauge.
- K. Concrete and Masonry Drilled Anchors
  - 1. General:
    - a. AISI Type 316 stainless, hot-dip galvanized, or zinc-plated steel,
    - b. Current evaluation and acceptance reports by ICC or other similar code organization.
  - 2. Expansion Anchors: Comply with ICC-ES Acceptance Criteria for Mechanical Anchors in Concrete Elements (AC 193, November 2010).
  - 3. Adhesive Anchors:
    - a. Comply with ICC-ES Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete (AC 308, May 2008).

Formatted: Level1

- b. Threaded Rod: ASTM F593 stainless steel threaded rod, diameter as shown on Drawings, length as required, to provide minimum depth of embedment, clean and free of grease, oil, or other deleterious material.
- c. Adhesive: Two-component, designed to be used in adverse freeze/thaw environments, with gray color after mixing, compatible for intended use and environmental conditions, nonsag, with selected viscosity base on installation temperature and overhead application where applicable.
- d. Packaging and Storage: Disposable, self-contained cartridge system capable of dispensing both components in the proper mixing ratio and fitting into a manually or pneumatically operated caulking gun. Store adhesive cartridges on pallets or shelving in covered storage area, in accordance with manufacturer's written instructions. Cartridge Markings: Include manufacturer's name, product name, material type, batch or serial number, and adhesive expiration date. Do not use cartridges if shelf life has expired.
- L. Grout: ASTM C1107, pourable type.
- M. Insect Screening: ASTM D3656.

### 2.3 HARDWARE

- A. Rough Hardware:
  - 1. Furnish rough hardware with a standard plating, applied after punching, forming and assembly of parts; galvanized, cadmium plated, or zinc-coated by electro-galvanizing process. Galvanized G-90 where specified.
  - 2. Use G90 galvanized coating on ferrous metal for exterior work unless non-ferrous metal or stainless is used.
- B. Fasteners:
  - 1. Bolts with Nuts:
    - a. ASME B18.2.2.
    - b. ASTM A307 for 415 MPa (60,000 psi) tensile strength bolts.
    - c. ASTM F468 for nonferrous bolts.
    - d. ASTM F593 for stainless steel.
  - 2. Screws: ASME B18.6.1.
  - 3. Washers: ASTM F436, type to suit material and anchorage.
  - 4. Nails: ASTM F1667, Type I, style 6 or 14 for finish work.

### 2.4 FABRICATION GENERAL

- A. Material
  - 1. Use material as specified. Use material of commercial quality and suitable for intended purpose for material that is not named or its standard of quality not specified.

2. Use material free of defects which could affect the appearance or serviceability of the finished product.

B. Size:

1. Size and thickness of members as shown.
2. When size and thickness is not specified or shown for an individual part, use size and thickness not less than that used for the same component on similar standard commercial items or in accordance with established shop methods.

C. Connections

1. Except as otherwise specified, connections may be made by welding or bolting.
2. Riveting will not be approved.
3. Design size, number and placement of fasteners, to develop a joint strength of not less than the design value.
4. Holes for bolts: Accurately punched or drilled and burrs removed.
5. Size and shape welds to develop the full design strength of the parts connected by welds and to transmit imposed stresses without permanent deformation or failure when subject to service loadings.
6. Use bolts of material selected to prevent corrosion (electrolysis) at bimetallic contacts. Plated or coated material will not be approved.
7. Use stainless steel connectors for removable members machine screws or bolts.

D. Fasteners and Anchors

1. Use methods for fastening or anchoring metal fabrications to building construction as shown or specified.
2. Where fasteners and anchors are not shown, design the type, size, location and spacing to resist the loads imposed without deformation of the members or causing failure of the anchor or fastener, and suit the sequence of installation.
3. Use material and finish of the fasteners compatible with the kinds of materials which are fastened together and their location in the finished work.
4. Fasteners for securing metal fabrications to new construction only, may be by use of threaded or wedge type inserts or by anchors for welding to the metal fabrication for installation before the concrete is placed or as masonry is laid.
5. Fasteners for securing metal fabrication to existing construction or new construction may be expansion bolts, toggle bolts, power actuated drive pins, welding, self drilling and tapping screws or bolts.

E. Workmanship

1. General:

- a. Fabricate items to design shown.
  - b. Furnish members in longest lengths commercially available within the limits shown and specified.
  - c. Fabricate straight, true, free from warp and twist, and where applicable square and in same plane.
  - d. Provide holes, sinkages and reinforcement shown and required for fasteners and anchorage items.
  - e. Provide openings, cut-outs, and tapped holes for attachment and clearances required for work of other trades.
  - f. Prepare members for the installation and fitting of hardware.
  - g. Cut openings in gratings and floor plates for the passage of ducts, sumps, pipes, conduits and similar items. Provide reinforcement to support cut edges.
  - h. Fabricate surfaces and edges free from sharp edges, burrs and projections which may cause injury.
2. Welding:
- a. Weld in accordance with AWS.
  - b. Welds shall show good fusion, be free from cracks and porosity and accomplish secure and rigid joints in proper alignment.
  - c. Where exposed in the finished work, continuous weld for the full length of the members joined and have depressed areas filled and protruding welds finished smooth and flush with adjacent surfaces.
  - d. Finish welded joints to match finish of adjacent surface.
3. Joining:
- a. Miter or butt members at corners.
  - b. Where frames members are butted at corners, cut leg of frame member perpendicular to surface, as required for clearance.
4. Anchors:
- a. Where metal fabrications are shown to be preset in concrete, weld 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 150 mm (6 inches) long with 25 mm (one inch) hooked end, to back of member at 600 mm (2 feet) on center, unless otherwise shown.
  - b. Where metal fabrications are shown to be built into masonry use 32 x 3 mm (1-1/4 by 1/8 inch) steel strap anchors, 250 mm (10 inches) long with 50 mm (2 inch) hooked end, welded to back of member at 600 mm (2 feet) on center, unless otherwise shown.
5. Cutting and Fitting:
- a. Accurately cut, machine and fit joints, corners, copes, and miters.
  - b. Fit removable members to be easily removed.

- c. Design and construct field connections in the most practical place for appearance and ease of installation.
- d. Fit pieces together as required.
- e. Fabricate connections for ease of assembly and disassembly without use of special tools.
- f. Joints firm when assembled.
- g. Conceal joining, fitting and welding on exposed work as far as practical.
- h. Do not show screws prominently on the exposed face.
- i. The fit of components and the alignment of holes shall eliminate the need to modify component or to use exceptional force in the assembly of item and eliminate the need to use other than common tools.

F. Finish:

- 1. Finish exposed surfaces in accordance with NAAMM Metal Finishes Manual.
- 2. Aluminum: NAAMM AMP 501.
  - a. Mill finish, AA-M10, as fabricated, use unless specified otherwise.
  - b. Clear anodic coating, AA-C22A41, chemically etched medium matte, with Architectural Class 1, 0.7 mils or thicker.
  - c. Colored anodic coating, AA-C22A42, chemically etched medium matte with Architectural Class 1, 0.7 mils or thicker.
  - d. Painted: AA-C22R10.
- 3. Steel and Iron: NAAMM AMP 504.
  - a. Zinc coated (Galvanized): ASTM A123, G90 unless noted otherwise.
  - b. Surfaces exposed in the finished work:
    - 1) Finish smooth rough surfaces and remove projections.
    - 2) Fill holes, dents and similar voids and depressions with epoxy type patching compound.
  - c. Shop Prime Painting:
    - 1) Surfaces of Ferrous metal:
      - a) Items not specified to have other coatings.
      - b) Galvanized surfaces specified to have prime paint.
      - c) Remove all loose mill scale, rust, and paint, by hand or power tool cleaning as defined in SSPC-SP2 and SP3.
      - d) Clean of oil, grease, soil and other detrimental matter by use of solvents or cleaning compounds as defined in SSPC-SP1.
      - e) After cleaning and finishing apply one coat of primer as specified in Section 09 91 00, PAINTING.

2) Non ferrous metals: Comply with MAAMM-500 series.

4. Stainless Steel: NAAMM AMP-504 Finish No. 4.

G. Protection:

1. Insulate aluminum surfaces that will come in contact with concrete, masonry, plaster, or metals other than stainless steel, zinc or white bronze by giving a coat of heavy-bodied alkali resisting bituminous paint or other approved paint in shop.
2. Spot prime all abraded and damaged areas of zinc coating which expose the bare metal, using zinc rich paint on hot-dip zinc coat items and zinc dust primer on all other zinc coated items.

## 2.5 SUPPORTS

A. General:

1. Fabricate ASTM A36 structural steel shapes as shown.
2. Use clip angles or make provisions for welding hangers and braces to overhead construction.
3. Field connections may be welded or bolted.

B. For Ceiling Hung Toilet Stall:

1. Use a continuous steel channel above pilasters with hangers centered over pilasters.
2. Make provision for installation of stud bolts in lower flange of channel.
3. Provide a continuous steel angle at wall and channel braces spaced as shown.
4. Use threaded rod hangers.
5. Provide diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.
6. Provide supports for ceiling hung pilasters at dressing booths and entrance screen to toilet room similar to support for toilet stall pilasters.

C. For Wall Mounted Items:

1. For items supported by metal stud partitions.
2. Steel strip or hat channel minimum of 1.5 mm (0.0598 inch) thick.
3. Steel strip minimum of 150 mm (6 inches) wide, length extending one stud space beyond end of item supported.
4. Steel hat channels where shown. Flange cut and flattened for anchorage to stud.
5. Structural steel tube or channel for grab bar at water closets floor to structure above with clip angles or end plates formed for anchors.
6. Use steel angles for thru wall counters. Drill angle for fasteners at ends and not over 100 mm (4 inches) on center between ends.

D. For Trapeze Bars:



1. Construct assembly above ceilings as shown and design to support not less than a 340 kg (750 pound) working load at any point.
  2. Fabricate trapeze supports as shown, with all exposed members, including screws, nuts, bolts and washers, fabricated of stainless steel.
  3. Fabricate concealed components of structural steel shapes unless shown otherwise.
  4. Stainless steel ceiling plate drilled for eye bolt.
  5. Continuously weld connections where welds shown.
  6. Use modular channel where shown with manufacturers bolts and fittings.
    - a. Weld ends of steel angle braces to steel plates and secure to modular channel units as shown. Drill plates for anchor bolts.
    - b. Fabricate eye bolt, special clamp bolt, and plate closure full length of modular channel at ceiling line and secure to modular channel unit with manufacturers standard fittings.
- E. For Intravenous Track and Cubical Curtain Track:
1. Fabricate assembly of steel angle as shown.
  2. Drill angle bent ends for anchor screws to acoustical suspension system and angle for hanger wires.
  3. Provide pipe sleeve welded to angle.
- F. For Operating Room Light:
1. Fabricate as shown to suit equipment furnished.
  2. Drill leveling plate for light fixture bolts.
- G. Supports for Accordion Partition Tracks, Exercise Equipment, and Items at Various Conditions at Suspended Ceilings:
1. Fabricate of structural steel shapes as shown.
  2. Drill for anchor bolts of suspended item.

## 2.6 GUARDS

- A. Edge Guard Angles for Openings in slabs.
1. Fabricate from steel angles of sizes and with anchorage shown.
  2. Where size of angle is not shown, provide 50 x 50 x 6 mm (2 x 2 x 1/4 inch) steel angle with 32 x 5 mm (1-1/4 x 3/16 inch) strap anchors, welded to back.
  3. Miter or butt angles at corners and weld.
  4. Use one anchor near end and three feet on centers between end anchors.
- B. Wheel Guards:
1. Construct wheel guards of not less than 16 mm (5/8 inch) thick cast iron.
  2. Provide corner type, with flanges for bolting to walls.

**2.7 COVERS AND FRAMES FOR PITS AND TRENCHES**

- A. Fabricate covers to support live loads specified.
- B. Galvanized steel members after fabrication in accordance with ASTM A123, G-90 coating.
- C. Steel Covers:
  - 1. Use 6 mm (1/4 inch) thick floor plate for covers unless otherwise shown. Use gratings where shown as specified in paragraph GRATINGS. Use smooth floor plate unless noted otherwise.
  - 2. Provide clearance at all sides to permit easy removal of covers.
  - 3. Make cutouts within 6 mm (1/4 inch) of penetration for passage of pipes and ducts.
  - 4. Drill covers for flat head countersunk screws.
  - 5. Make cover sections not to exceed 2.3 m<sup>2</sup> (25 square feet) in area and 90 kg (200 pounds) in weight.
  - 6. Fabricate trench cover sections not be over 900 mm (3 feet) long and if width of trench is more than 900 mm (3 feet), equip one end of each section with an angle or "T" bar stiffener to support adjoining plate.
  - 7. Use two, 13 mm (1/2 inch) diameter steel bar flush drop handles for each cover section.
- D. Steel Frames:
  - 1. Form frame from structural steel angles as shown. Where not shown use 63 x 63 x 6 mm (2-1/2 x 2-1/2 x 1/4 inch) angles for frame openings over 1200 mm (4 feet) long and 50 x 50 x 6 mm (2 ix 2 x 1/4 inch) for frame openings less than 1200 mm (4 feet).
  - 2. Fabricate intermediate supporting members from steel "T's" or angles; located to support cover section edges.
  - 3. Where covers are required use steel border bars at frames so that top of cover will be flush with frame and finish floor.
  - 4. Weld steel strap anchors to frame. Space straps not over 600 mm (24 inches) o.c., not shown otherwise between end anchors. Use 6 x 25 x 200 mm (1/4 x 1 x 8 inches) with 50 mm (2 inch) bent ends strap anchors unless shown otherwise.
  - 5. Drill and tap frames for screw anchors where plate covers occur.

**2.8 GRATINGS**

- A. Provide welded metal bar grating configured as shown on the Drawings.
  - 1. Bearing Bar: Depth and thickness as indicated, plain walking surface, bearing bar spacing 1 3/16 inches.
  - 2. Cross Bar: Spacing not to exceed 4 inches center to center.
  - 3. Material: ASTM A36
- B. Provide clearance at all sides to permit easy removal of grating.

- C. Make cutouts in gratings with 6 mm (1/4 inch) minimum to 25 mm (one inch) maximum clearance for penetrations or passage of pipes and ducts. Edge band cutouts.
- D. Fabricate in sections no less than 450 mm (18 inches) wide, not to exceed 2.3 m<sup>2</sup> (25 square feet) in area, and 90 kg (200 pounds) in weight.
- E. Fabricate all sections of grating with end-banding bars, with dimensions as required to provide minimum 25 mm (1 inch) bearing at all supporting surfaces.
- F. Fabricate angle frames and supports, including anchorage as shown.
  - 1. Fabricate intermediate supporting members from "T's" or angles.
  - 2. Locate intermediate supports to support grating section edges.
  - 3. Fabricate frame to finish flush with top of grating.
  - 4. Locate anchors at ends and at spacing indicated on Drawings, but not over 600 mm (24 inches) o.c.
  - 5. Butt or miter, and weld angle frame at corners.
- G. Finishes:
  - 1. Galvanize steel members after fabrication in accordance with ASTM A123, G-90 for exterior gratings, gratings in concrete floors, and interior grating where specified.
- H. Accessories:
  - 1. Grating Clamps, removable from above grating surface, provide at all supporting surfaces except as noted on Drawings.

## 2.9 LOOSE LINTELS

- A. Furnish lintels of sizes shown. Where size of lintels is not shown, provide the sizes specified.
- B. Fabricate lintels with not less than 150 mm (6 inch) bearing at each end for nonbearing masonry walls, and 200 mm (8 inch) bearing at each end for bearing walls.
- C. Provide one angle lintel for each 100 mm (4 inches) of masonry thickness as follows except as otherwise specified or shown.
  - 1. Openings 750 mm to 1800 mm (2-1/2 feet to 6 feet) - 125 x 90 x 8 mm (5 x 3-1/2 x 5/16 inch).
  - 2. Openings 1800 mm to 3000 mm (6 feet to 10 feet) - 125 x 125 x 9 mm (5 x 5 x 3/8 inch).
- D. Provide bearing plates for lintels where shown.
- E. Where shown or specified, punch upstanding legs of single lintels to suit size and spacing of anchor bolts.

## 2.10 SHELF ANGLES

- A. Fabricate from steel angles of size shown.

- B. Fabricate angles with horizontal slotted holes for 19 mm (3/4 inch) bolts spaced at not over 900 mm (3 feet) on centers and within 300 mm (12 inches) of ends.
- C. Provide adjustable malleable iron inserts for embedded in concrete framing.

#### **2.11 SAFETY NOSINGS**

- A. Fed. Spec. RR-T-650, Type C.
  - 1. Aluminum: Class 2, Style 2.
- B. Fabricate nosings for exterior and interior use from cast aluminum.
- C. Fabricate nosings approximately 100 mm (4 inches) wide with not more than 9 mm (3/8 inch) nose.
- D. Provide nosings with integral type anchors spaced not more than 100 mm (4 inches) from each end and intermediate anchors spaced approximately 375 mm (15 inches) on center.
- E. Fabricate nosings to extend within 100 mm (4 inches) of ends of concrete stair treads except where shown to extend full width.
- F. Fabricate nosings to extend full width between stringers of metal stairs and full width of door openings.

#### **2.12 LADDERS**

- A. Steel Ladders:
  - 1. Fixed-rail type with steel rungs shouldered and headed into and welded to rails.
  - 2. Fabricate angle brackets of 50 mm (2 inch) wide by 13 mm (1/2 inch) thick steel; brackets spaced maximum of 1200 mm (4 feet) apart and of length to hold ladder 175 mm (7 inches) from wall to center of rungs. Provide turned ends or clips for anchoring.
  - 3. Provide holes for anchoring with expansion bolts through turned ends and brackets.
  - 4. Where shown, fabricate side rails curved, twisted and formed into a gooseneck.
  - 5. Galvanize exterior ladders after fabrication, ASTM A123, G-90.

#### **2.13 RAILINGS**

- A. In addition to the dead load, design railing assembly to support live load specified.
- B. Fabrication General:
  - 1. Provide continuous welded joints, dressed smooth and flush.
  - 2. Standard flush fittings, designed to be welded, may be used.
  - 3. Exposed threads will not be approved.
  - 4. Form handrail brackets to size and design shown.
  - 5. Exterior Post Anchors.

- a. Provide flanged fittings welded or threaded to posts for securing to concrete with expansion bolts.
  - b. Provide heavy pattern sliding flange base plate with set screws at base of pipe or tube posts.
- 6. Interior Post Anchors:
  - a. Provide flanged fittings for securing fixed posts to floor with expansion bolts, unless shown otherwise.
  - b. Weld or thread flanged fitting to posts at base.
  - c. For securing removable posts to floor, provide close fitting sleeve insert or inverted flange base plate with stud bolts or rivets concrete anchor welded to the base plate.
  - d. Provide sliding flange base plate on posts secured with set screws.
  - e. Weld flange base plate to removable posts set in sleeves.
- C. Handrails:
  - 1. Close free ends of rail with flush metal caps welded in place except where flanges for securing to walls with bolts are shown.
  - 2. Make provisions for attaching handrail brackets to wall, posts, and handrail as shown.
- D. Steel Pipe Railings:
  - 1. Fabricate steel pipe with welded joints.
  - 2. Number and space of rails as shown.
  - 3. Space posts for railings not over 1800 mm (6 feet) on centers between end posts.
  - 4. Form handrail brackets from malleable iron.
- 5. Opening Guard Rails:
  - a. Fabricate rails with flanged fitting at each end to fit between wall opening jambs.
  - b. Design flange fittings for fastening with machine screws to steel plate anchored to jambs.
  - c. Fabricate rails for floor openings for anchorage in sleeves.

#### **2.14 FALL ARREST ANCHORS**

- A. General
- B. Conforms to OSHA CFR Part 1926.502.
- C. Minimum breaking strength: 5,000 pounds.
- D. Material: Stainless steel, AISI Type 304.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION, GENERAL**

- A. Set work accurately, in alignment and where shown, plumb, level, free of rack and twist, and set parallel or perpendicular as required to line and plane of surface.

- B. Items set into concrete or masonry.
  - 1. Provide temporary bracing for such items until concrete or masonry is set.
  - 2. Place in accordance with setting drawings and instructions.
  - 3. Build strap anchors, into masonry as work progresses.
- C. Set frames of gratings, covers, corner guards, and similar items flush with finish floor or wall surface and, where applicable, flush with side of opening.
- D. Field weld in accordance with AWS.
  - 1. Design and finish as specified for shop welding.
  - 2. Use continuous weld unless specified otherwise.
- E. Install anchoring devices and fasteners as shown and as necessary for securing metal fabrications to building construction as specified. Powder actuated drive pins may be used except for removable items and where members would be deformed or substrate damaged by their use.
- F. No fasteners or attachments of any kind, including but not limited to welds, bolts, screws, powder actuated fasteners, etc., are permitted within protected zones of special moment frame beams. See Drawings for dimensions of protected zones.
- G. Spot prime all abraded and damaged areas of zinc coating as specified and all abraded and damaged areas of shop prime coat with same kind of paint used for shop priming.
- H. Isolate aluminum from dissimilar metals and from contact with concrete and masonry materials as required to prevent electrolysis and corrosion.
- I. Secure escutcheon plate with set screw.

### 3.2 INSTALLATION OF SUPPORTS

- A. Anchorage to structure.
  - 1. Secure angles or channels and clips to overhead structural steel by continuous welding unless bolting is shown.
  - 2. Secure supports to concrete inserts by bolting or continuous welding as shown.
  - 3. Secure supports to mid height of concrete beams when inserts do not exist with expansion bolts and to slabs, with expansion bolts, unless shown otherwise.
  - 4. Secure steel plate or hat channels to studs as detailed.
- B. Ceiling Hung Toilet Stalls:
  - 1. Securely anchor hangers of continuous steel channel above pilasters to structure above.
  - 2. Bolt continuous steel angle at wall to masonry or weld to face of each metal stud.

3. Secure brace for steel channels over toilet stall pilasters to wall angle supports with bolts at each end spaced as shown.
  4. Install diagonal angle brace where the suspended ceiling over toilet stalls does not extend to side wall of room.
  5. Install stud bolts in lower flange of channel before installing furred down ceiling over toilet stalls.
  6. Install support for ceiling hung pilasters at entrance screen to toilet room similar to toilet stall pilasters.
- C. Supports for Wall Mounted items:
1. Locate center of support at anchorage point of supported item.
  2. Locate support at top and bottom of wall hung cabinets.
  3. Locate support at top of floor cabinets and shelving installed against walls.
  4. Locate supports where required for items shown.
- D. Ceiling Support for Operating Light:
1. Anchor support to structure above as shown.
  2. Set leveling plate as shown level with ceiling.
  3. Secure operating light to leveling plate in accordance with light manufacturer's requirements.
- E. Supports for intravenous (IV) Track and Cubicle Curtain Track:
1. Install assembly where shown after ceiling suspension grid is installed.
  2. Drill angle for bolt and weld nut to angle prior to installation of tile.
- F. Support for cantilever grab bars:
1. Locate channels or tube in partition for support as shown, and extend full height from floor to underside of structural slab above.
  2. Anchor at top and bottom with angle clips bolted to channels or tube with two, 9 mm (3/8 inch) diameter bolts.
  3. Anchor to floors and overhead construction with two 9 mm (3/8 inch) diameter bolts.
  4. Fasten clips to concrete with expansion bolts, and to steel with machine bolts or welds.
- G. Supports for Trapeze Bars:
1. Secure plates to overhead construction with fasteners as shown.
  2. Secure angle brace assembly to overhead construction with fasteners as shown and bolt plate to braces.
  3. Fit modular channel unit flush with finish ceiling, and secure to plate with modular channel unit manufacturer's standard fittings through steel shims or spreaders as shown.
    - a. Install closure plates in channel between eye bolts.

- b. Install eyebolts in channel.

### **3.3 COVERS AND FRAMES FOR PITS AND TRENCHES**

- A. Set frame and cover flush with finish floor.
- B. Secure plates to frame with flat head countersunk screws.
- C. Set gratings loose in drainage trenches or over pits unless shown anchored.

### **3.4 DOOR FRAMES**

- A. Secure clip angles at bottom of frames to concrete slab with expansion bolts as shown.
- B. Level and plumb frame; brace in position required.
- C. At masonry, set frames in walls so anchors are built-in as the work progresses unless shown otherwise.
- D. Set frames in formwork for frames cast into concrete.
- E. Where frames are set in prepared openings, bolt to wall with spacers and expansion bolts.

### **3.5 GUARDS**

- A. Wheel Guards:
  - 1. Set flanges of wheel guard at least 50 mm (2 inches) into pavement.
  - 2. Anchor to walls as shown, expansion bolt if not shown.

### **3.6 GRATINGS**

- A. Set grating to elevation indicated or flush with finish floor; top of curb, or areaway wall. Set frame so that horizontal leg of angle frame is flush with face of wall except when frame is installed on face of wall.
- B. Where grating terminates at a wall bolt frame to concrete or masonry with expansion bolts unless shown otherwise.
- C. Secure removable supporting members in place with stainless steel bolts.
- D. Bolt gratings to supports.

### **3.7 STEEL LINTELS**

- A. Use lintel sizes and combinations shown or specified.
- B. Install lintels with longest leg upstanding, except for openings in 150 mm (6 inch) masonry walls install lintels with longest leg horizontal.
- C. Install lintels to have not less than 150 mm (6 inch) bearing at each end for nonbearing walls, and 200 mm (8 inch) bearing at each end for bearing walls.

### **3.8 SHELF ANGLES**

- A. Anchor shelf angles with 19 mm (3/4 inch) bolts unless shown otherwise in adjustable malleable iron inserts, set level at elevation shown.
- B. Provide expansion space at end of members.



### 3.9 SAFETY NOSINGS

- A. Except as specified and where preformed rubber treads are shown or specified install safety nosings at the following:
  - 1. Exterior concrete steps.
  - 2. Door sills of areaway entrances curbs.
  - 3. Exposed edges of curbs of door sills at transformer and service rooms.
  - 4. Interior concrete steps, including concrete filled treads of metal stairs of service stairs.
- B. Install flush with horizontal and vertical surfaces.
- C. Install nosing to within 100 mm (4 inches) of ends of concrete stair treads, except where shown to extend full width.
- D. Extend nosings full width of door openings.
- E. Extend nosings, full width between stringers of metal stairs, and terminate at point of curvature of steps having short radius curved ends.

### 3.10 LADDERS

- A. Anchor ladders to walls and floors with expansion bolts through turned lugs or angle clips or brackets.

### 3.11 RAILINGS

- A. Steel Posts:
  - 1. Secure fixed posts to concrete with expansion bolts through flanged fittings.
  - 2. Secure removable posts to concrete with either machine screws through flanged fittings which are secured to inverted flanges embedded in and set flush with finished floor, or set posts in close fitting pipe sleeves without grout.
  - 3. Secure sliding flanged fittings to posts at base with set screws.
  - 4. Secure fixed flanged fittings to concrete with expansion bolts.
  - 5. Secure posts to steel with welds.
- B. Anchor to Walls:
  - 1. Anchor rails to concrete or solid masonry with machine screws through flanged fitting to steel plate.
    - a. Anchor steel plate to concrete or solid masonry with expansion bolts.
    - b. Anchor steel plate to hollow masonry with toggle bolts.
  - 2. Anchor flanged fitting with toggle bolt to steel support in frame walls.
- C. Handrails:
  - 1. Anchor brackets for metal handrails as detailed.
  - 2. Install brackets within 300 mm (12 inches) of return of walls, and at evenly spaced intermediate points not exceeding 1200 mm (4 feet) on centers unless shown otherwise.

3. Expansion bolt to concrete or solid masonry.
4. Toggle bolt to installed supporting frame wall and to hollow masonry unless shown otherwise.

**3.12 SIDEWALK DOOR AND FRAMES**

- A. Set frame flush with finished concrete slab or curb.
- B. Secure well linings to structure with expansion bolts unless shown otherwise.
- C. Coordinate sidewalk door drain connections with plumbing work.

**3.13 STEEL COMPONENTS FOR MILLWORK ITEMS**

- A. Coordinate and deliver to Millwork fabricator for assembly where millwork items are secured to metal fabrications.

**3.14 CLEAN AND ADJUSTING**

- A. Adjust movable parts including hardware to operate as designed without binding or deformation of the members centered in the opening or frame and, where applicable, contact surfaces fit tight and even without forcing or warping the components.
- B. Clean after installation exposed prefinished and plated items and items fabricated from stainless steel, aluminum and copper alloys, as recommended by the metal manufacture and protected from damage until completion of the project.

- - - E N D - - -

**SECTION 05 51 00**  
**METAL STAIRS**

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Section specifies steel stairs with railings.
- B. Types:
  - 1. Closed riser stairs with concrete filled treads and platforms.  
Stringers shall be HSS sections as shown on the Drawings.

**1.2 RELATED WORK**

- A. Concrete fill for treads and platforms: Section 03 30 00, CAST-IN-PLACE CONCRETE.
- B. Composite metal decking for landings: Section 05 36 00, COMPOSITE METAL DECKING.
- C. Wall handrails and railings for other than steel stairs: Section 05 50 00, METAL FABRICATIONS.
- D. Requirements for shop painting: Section 09 91 00, PAINTING.

**1.3 SUBMITTALS**

- A. Submit in accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES.
- B. Shop Drawings: Show design, fabrication details, installation, connections, material, and size of members.
- C. Calculations.

**1.4 APPLICATION PUBLICATIONS**

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by basic designation.
- B. American Society for Testing and Materials (ASTM):
  - A36/A36M-05.....Structural Steel
  - A47-99 (R2004).....Ferritic Malleable Iron Castings
  - A48-03.....Gray Iron Castings
  - A53-06.....Pipe, Steel, Black and Hot-Dipped Zinc-Coated  
Welded and Seamless
  - A307-07.....Carbon Steel Bolts and Studs, 60000 psi Tensile  
Strength
  - A500-01.....Standard Specification for Cold Formed Welded  
and Seamless Carbon Steel Structural Tubing in  
Rounds and Shapes
  - A653/653M-07.....Steel Sheet, Zinc Coated (Galvanized) or Zinc  
Alloy Coated (Galvannealed) by the Hot-Dip  
Process

- A563-07.....Carbon and Alloy Steel Nuts
- A1008-07.....Steel, Sheet, Cold-Rolled, Carbon, Structural,  
High-Strength, Low-Alloy
- A786/A786M-00.....Rolled Steel Floor Plates
- A993/A992M-02.....Standard Specification for Structural Steel  
Shapes
- A1011-04.....Steel, Sheet and Strip, Strip, Hot-Rolled  
Carbon, Structural, High-Strength, Low-Alloy
- C. American Welding Society (AWS):
  - D1.1-04.....Structural Welding Code-Steel
  - D1.3-98.....Structural Welding Code-Sheet Steel
- D. The National Association of Architectural Metal Manufacturers (NAAMM)  
Manuals:
  - Metal Bar Gratings (ANSI/NAAMM MBG 531-00)
  - AMP521-01.....Pipe Railing Manual, Including Round Tube
- E. American Iron and Steel Institute (AISI):
  - 2001.....Design of Cold-Formed Steel Structural Members

## **PART 2 - PRODUCTS**

### **2.1 DESIGN CRITERIA**

- A. Design stairs to support a uniform live load of 500 kg/m<sup>2</sup> (100 pounds per square foot). Treads shall be designed for a 350 pound point load (not concurrent with the uniform live load).
- B. Structural design, fabrication and assembly in accordance with requirements of NAAMM Metal Stairs Manual, except as otherwise specified or shown.
- C. Design pipe railings in accordance with NAAMM Pipe Railing Manual for 900 N (200 pounds) in any direction at any point or 730 N/m (50 pounds/ft) in any direction along top rail.

### **2.2 MATERIALS**

- A. Steel Pipe: ASTM A53, Standard Weight, zinc coated.
- B. Steel Grating: Metal bar type grating NAAMM BG.
- C. Sheet Steel: ASTM A1008.
- D. Structural Steel: ASTM A992 for W-shapes, ASTM A500 Grade B for HSS Sections, and ASTM A36 for other shapes.
- E. Steel Floor Plate: ASTM 786.
- F. Steel Decking: As specified in Section 05 36 00, COMPOSITE METAL DECKING.
- G. Steel Plate: ASTM A1011 or ASTM A36.
- H. Iron Castings: ASTM A48, Class 30.
- I. Malleable Iron Castings: ASTM A47.

**2.3 FABRICATION GENERAL**

- A. Fasteners:
  - 1. Conceal bolts and screws wherever possible.
  - 2. Use countersunk heads on exposed bolts and screws with ends of bolts and screws dressed flush after nuts are set.
- B. Welding:
  - 1. Structural steel, AWS D1.1 and sheet steel, AWS D1.3.
  - 2. Where possible, locate welds on unexposed side.
  - 3. Grind exposed welds smooth and true to contour of welded member.
  - 4. Remove welding splatter.
- C. Remove sharp edges and burrs.
- D. Fit stringers to head channel and close ends with steel plates welded in place where shown.
- E. Shop Prime Painting: Prepare surface and apply primer as specified for ferrous metals in Section 09 91 00, PAINTING.

**2.4 RAILINGS**

- A. Fabricate railings, including handrails, from steel pipe with flush.
  - 1. Connections may be standard fittings designed for welding, or coped or mitered pipe with full welds.
  - 2. Wall handrails are provided under Section 05 50 00, METAL FABRICATIONS.
- B. Return ends of handrail to wall and close free end.
- C. Space intermediate posts not over six feet on center between end posts.
- D. Fabricate handrail brackets from cast malleable iron or structural steel.
- E. Provide standard terminal fittings at ends of post and rails.

**2.5 CLOSED RISER STAIRS**

- A. Provide treads, risers, platforms, railings, stringers, headers and other supporting members.
- B. Fabricate pans for treads and platforms, and risers from sheet steel. Fabricate pans for platforms from composite steel decking where shown.
- C. Form risers with sanitary cove.
- D. Fabricate stringers, headers, and other supporting members from structural steel.

**PART 3 - EXECUTION****3.1 STAIR INSTALLATION**

- A. Provide hangers and struts required to support the loads imposed.
- B. Perform job site welding and bolting as specified for shop fabrication.
- C. Set stairs and other members in position and secure to structure as shown.

- D. Install stairs plumb, level and true to line.
- E. Provide steel closure plate to fill any gap greater than 13 mm (1/2 inch) between the stringer and surrounding shaft wall. Weld and finish with prime and paint finish of adjoining steel.

### **3.2 RAILING INSTALLATION**

- A. Install standard terminal fittings at ends of posts and rails.
- B. Secure brackets, posts and rails to steel by welds, and to masonry or concrete with expansion sleeves and bolts, except secure posts at concrete by setting in sleeves filled with commercial non-shrink grout.
- C. Set rails horizontal or parallel to rake of stairs to within 3 mm in 3650 mm (1/8-inch in 12 feet).
- D. Set posts plumb and aligned to within 3 mm in 3650 mm (1/8-inch in 12 feet).

### **3.3 FIELD PRIME PAINTING**

- A. When installation is complete, clean field welds and surrounding areas to bright metal, and coat with same primer paint used for shop priming.
- B. Touch-up abraded areas with same primer paint used for shop priming.
- C. Touch up abraded galvanized areas with zinc rich paint as specified in section 09 91 00, PAINTING.

- - - E N D - - -